2. CONSTITUENTS OF POTENTIAL CONCERN

Throughout the course of the Parcel A investigation and demolition program, numerous soil samples have been collected. However, because these samples were designed to address specific site characterization issues, not all can be used in a health risk assessment. A detailed data evaluation process was required to determine the validity and usefulness of the sample results in this quantitative risk assessment (EPA 1992b).

Section 2.1 summarizes the historical and recent data collection efforts and characterizes the overall post-demolition site conditions at Parcel A. Section 2.2 presents the validation and quality assessment procedures for the analytical data collected.

Once the data were determined to be valid and of sufficient quality to be used in a quantitative risk assessment, further screening procedures were employed to identify the constituents of potential concern (COPCs). The screening process was designed to: 1) reduce the number of analytes to a manageable size, so a detailed quantitative risk analysis could be performed, 2) ensure the analytes selected represent the majority of the site-related risk, and 3) ensure that all localized "hot spots" are addressed. Section 2.3 discusses the screening and selection procedures for Parcel A COPCs. The selected COPCs are used throughout the remainder of the post-demolition risk assessment.

2.1 SUMMARY OF DATA SOURCES

This section addresses the sources and types of data as well as other site-specific information used in the selection of the post-demolition COPCs for Parcel A. The data evaluated include the analytical results of over 10 years of sampling Parcel A surface and subsurface soils.

2.1.1 Historical Soils Data

Woodward-Clyde Consultants conducted the first investigations of the C-6 facility during its underground storage tank (UST) management program (WCC 1987). Later, Woodward-Clyde and James M. Montgomery Consulting Engineers conducted expanded investigations (WCC 1990 and JMM 1992).

A Phase I environmental assessment of Parcel A was conducted by Kennedy/Jenks in 1996 (K/J 1996a). Areas believed to be of "environmental interest" were identified, including those where contamination had already been detected, where chemicals were used or stored, where surface staining was visible, or where sumps, tanks, or clarifiers were located.

The data from these historical studies are further evaluated later in this section.

2.1.2 Parcel A Phase II Soil Data

Prior to demolition, Parcel A was systematically sampled to identify potential areas of contamination. Sampling locations were closely correlated with known facility operations and findings from previous investigation results (K/J 1997). Analytical results from the Parcel A Phase II Soil Characterization were supplied to RWQCB and DTSC for review in July 1997 (K/J 1997). These data represent the most recent characterization of site conditions prior to demolition. Except for the data pertaining to soils excavated during demolition (see Section 2.1.5, below), the Phase II data were used in this post-demolition risk assessment.

2.1.3 Imported-Soils Data

Approximately 20,000 cubic yards of clayey soils were imported from several off-site locations for use as backfill. These soils are referred to throughout this report as *imported soils*. Samples were collected from each place of origin to ensure that material being introduced to the site was not contaminated. Once the material had been shown to be "clean," it was released for use as backfill. The analytical results of this sampling were not considered in the selection of COPCs for this risk assessment or in the statistical derivation of exposure point concentrations, due to the clean nature of the imported soils.

2.1.4 Verification Data

Under a self-imposed program, contaminated soils identified during demolition were excavated until the remaining contaminant concentrations were below the health-based remediation goals (HBRGs) developed by Integrated (IESI 1997b). The chemical properties of these residual areas is characterized in the soil confirmation reports (MW 1997a, 1997b, 1997c, 1997d, 1997e). The results of the soil samples taken from these areas were used in the selection of post-demolition COPCs for this risk assessment.

It is important to note the these HBRG values have not been approved by DTSC as site cleanup goals and were used only for internal, soil-screening purposes during demolition. The use of these values does not guarantee DTSC approval of soil closure and were used at Boeing's own risk. It is understood by all parties that the findings of this risk assessment will establish whether Parcel A requires further remediation.

2.1.5 Excavated-Soils Data

Excavations were conducted to remove affected soils identified during demolition. Specifically, soils were excavated based on any of four criteria: a PID reading greater than 5 ppm, visible staining, a noticeable odor, or as indicated by sampling conducted in accordance with the Sampling and Analysis Plan for Demolition Activities (IESI 1997a). In accordance with RWQCB direction, these soils were stockpiled in 250-cubic-yard lots and characterized. Soils exceeding the HBRG values or Title 22 criteria were shipped off-site for proper disposal. Soils shown to have concentrations below the self-imposed HBRGs and Tittle 22 limits were cleared by RWQCB for use as backfill (MW 1997a, 1997b, 1997c, 1997d, 1997e).

The sample results of soil used as backfill are included in the selection of COPCs and the statistical derivation of exposure point concentrations (MW 1997a, 1997b, 1997c, 1997d, 1997e).

2.2 DETERMINATION OF DATA USEABILITY

The data validation process for the post-demolition risk assessment was divided into several steps. The first step was to compile all site-related analytical data. This was followed by a screening of data that reflect Parcel A conditions, a review of sampling protocols and documentation, the determination of data sources, and an examination of data qualifiers and flags. Overall, the results of more than 1,500 samples were compiled, sorted, and reviewed. Section 2.1 identifies those data that reflect current Parcel A conditions. The rest of the data usability determination is discussed below.

2.2.1 Documentation

The key field documents reviewed in the validation process are:

- Field daily activity logs
- Sample collection logs
- Specific field forms for sample collection and handling
- Chain-of-custody forms and requests for analysis
- Field personnel training documents
- Variances, surveillance reports of field activities

The key analytical data reviewed in the validation process are:

- Organic constituents
  - Holding times

- Gas chromatography/mass spectroscopy (GC/MS) calibration
- Surrogate recoveries
- Matrix spikes, matrix spike duplicates
- Blank evaluations using the 5X/10X rule
- Internal standards

• Inorganic constituents

- Holding times
- Inductively Coupled Plasma/Graphite Furnace Atomic Analysis (ICP/GFAA)
- Instrument performance checks
- Initial and continuing calibrations
- Blank evaluations
- Spike sample analyses

2.2.2 Data Sources

Depending on the objectives of the individual studies, the following three types of analytical data have been acquired throughout the investigation and demolition phases of the Parcel A redevelopment project:

1. Field-screening data, collected using field test kits, chemical-specific probes, and other monitoring equipment.
2. Field-laboratory data, from analyses conducted by state-certified field (mobile) laboratories using instruments and procedures equivalent to those of fixed-laboratory analyses.
3. Fixed-laboratory data, from analyses conducted on the majority of all samples submitted for analysis.

No field-screening results were used in this post-demolition risk assessment. Only results obtained using field- or fixed-laboratory analyses were considered.

2.2.3 Data Validation

Data validation is an after-the-fact, independent, and systematic process of evaluating data and comparing the results to pre-established criteria. For this post-demolition risk assessment, specific quality control indicators associated with the data were reviewed to determine whether the stipulated data quality objectives have been met. The objectives addressed five principal parameters: precision, accuracy, completeness, comparability, and representativeness. To verify that the objectives were met, field measurements, sampling and handling procedures, laboratory analysis and reporting, and nonconformance and discrepancies in the data were examined to determine compliance with the appropriate and applicable procedures. The procedures and criteria for validation are defined in the RI/FS Data Validation Program Guidelines, which are based on the EPA National Functional Guidelines for Data Review (EPA 1988a, 1988b).

The validation process culminates in the assignment of a qualifier flag for each analyte defining the confidence level in the data. The measured constituent concentrations obtained during the investigative and demolition phases of Parcel A sampling and used in this risk assessment have been validated. Analytical results for constituents were reported using Contract Laboratory Program (CLP) data qualifiers. Matrix spike and matrix spike duplicate data were analyzed as stipulated in EPA guidance (EPA 1992c).

Data that do not adequately meet the criteria addressed during data validation were flagged with an "R" qualifier and were not used in the quantitative risk assessment. Data flagged with the "J" qualifier, meaning the values are "estimated," were used in the quantitative risk assessment according to EPA guidance (EPA 1988a, 1988b, 1992c).

2.2.4 Detection Limits

The screening of analytical methods used in sample analysis is critical to the inclusion of data for risk assessment purposes (EPA 1992c). Throughout the numerous investigations, there were times when samples were taken from the same location and analyzed for the same constituents using different analytical methods or detection limits. In the data validation process, those samples that have the lowest detection limits were retained for selection of COPCs.

In determining data usability for risk assessment, the analytical methods employed were first reviewed and selected. The selected method is the one that meets risk assessment requirements and has sufficient quality control measures to ensure confident identification and quantitation of target compounds. The detection limit of the method directly affects the usefulness of the data, as constituents reported near the detection limit have a greater possibility of false negatives and positives.

2.2.5 Consistency in Data Collection

Data collection activities may vary among parties conducting the sampling. All parties collecting environmental analytical data for the post-demolition risk assessment were required to follow the Sampling and Analysis Plan (SAP) for Demolition Activities (IESI 1997a) and supporting procedures that direct quality-related activities. The SAP includes the data quality objectives, work performance requirements to meet the objectives, means for verifying the objectives have been met, and a discussion of the data validation process. Before the inclusion of any historical data in this quantitative risk assessment, the data were reviewed thoroughly to ensure the analytical results are of the highest quality.

2.2.6 Qualified Data

All data were validated based upon the criteria presented in Section 2.2.3. When quality control indicators were found to be below the acceptable performance criteria, the accompanying data results were given qualifiers. All data not assigned qualifiers are of acceptable quality and were used during COPC selection. Estimated quantitative results, such as those identified by a "J" qualifier, were used in COPC selection (EPA 1992c). The "'J" qualifier describes an estimated value for a tentatively identified constituent or one that is present but whose value is less than the required quantitation limit. Analytical results that are at or below detection limits were qualified with a "U" and were used in the post-demolition risk assessment as described in Section 2.5.1.

"X" qualifiers were assigned to all data found to be invalid as described in Section 5.2. The 1987 Woodward-Clyde subsurface investigation results were found to be below acceptance criteria for use in the post-demolition risk assessment. Numerous samples collected since this study in the same sample locations have shown dramatically different results. These Woodward-Clyde results have not been included in this post-demolition risk assessment.

2.2.7 Data Usability Summary

The approach for selecting suitable data for the risk assessment follows EPA guidance (EPA 1992c). All data were evaluated according to the aforementioned criteria of precision, accuracy completeness, comparability, and representativeness. With the exception of the 1987 Woodward-Clyde subsurface investigation report (WCC 1990), Parcel A characterization data were found to be valid and of acceptable usability for inclusion in this quantitative risk assessment. Appendix C presents the data set used in the post-demolition risk assessment.

2.3 SELECTION OF CONSTITUENTS OF POTENTIAL CONCERN

Due to the extensive amount of historical data for soils and the number of non-detected analytes reported under the standard SW846 methods, a screening methodology was developed to identify COPCs. The objectives of this screening process were to: 1) reduce the number of analytes to a manageable size, so a detailed quantitative risk analysis could be performed on detected constituents, 2) ensure the analytes selected represent the Parcel A related post-demolition risk, and 3) ensure that all localized hot spots have been addressed. The following presents the COPC identification process as agreed upon by DTSC/HERD and Integrated (IESI 1998a).

The screening methodology for detected constituents in Parcel A soils was developed in a conservative manner to ensure that all COPCs and localized hot spots are addressed. The following methodology has been agreed upon between DTSC/HERD and Integrated:

1. Identify all constituents detected in Parcel A soils.

2. Retain all Group A carcinogens.

3. Calculate the frequency of detection per constituent, per medium.

4. Retain all constituents detected at a frequency of 5 percent or higher (per medium).

5. Retain all organic constituents detected at a frequency of less than 5 percent (per medium) with maximum detects that exceed EPA Region IX residential preliminary remediation goals (PRGs) or DTSC/HERD surrogate values.

6. Compare the 95 percent upper confidence limit (UCL) concentrations of inorganic constituents (normal distribution) to environmental background concentrations. Retain all inorganic constituents that exceed the background levels.

Step 1

Table 2-1 lists constituents detected in at least one soil sampling event on Parcel A. A constituent was not included in the initial COPC list if the analysis performed on it is designed for compound-class identification or if its analytical results are not compound specific.

Step 2

There are obvious health concerns whenever the potential for exposure to known human carcinogens exists. Therefore, the identification and analysis of these substances is of the utmost importance in a quantitative risk assessment. In assessing carcinogenic potential, EPA classifies constituents into five groups based on the weight of evidence collected from epidemiological studies. These studies examine the relationship between exposure to a constituent and the subsequent development of cancer. The five groups are:

- Group A — Human carcinogen (sufficient evidence of carcinogenicity in humans)
- Group B — Probable human carcinogen (B1 - limited evidence of carcinogenicity in humans; B2 - sufficient evidence in animals with inadequate or lack of evidence in humans)
- Group C — Possible human carcinogen (limited evidence of carcinogenicity in animals and inadequate evidence in humans)
- Group D — Not classifiable as to human carcinogenicity (inadequate or no evidence)
- Group E — Evidence of noncarcinogenicity for humans (no evidence of carcinogenicity in adequate studies)

No organic Group A constituents were detected in Parcel A. The only inorganic Group A constituent detected, arsenic, was retained as a COPC.

Steps 3 and 4

Frequency of detection was calculated for each constituent to identify those found throughout Parcel A soils. Constituents found in more than 5 percent of soil samples are most likely, based of abundance and distribution, to present receptor exposures. Therefore, these "frequently detected" constituents were retained for quantitative risk analysis.

Step 5

The maximum concentrations of organic constituents detected in less than 5 percent of soil samples were compared to EPA Region IX preliminary remediation goals (PRGs) or DTSC/HERD surrogate values for residential exposures. Those exceeding residential PRGs were retained as COPCs. Those that do not exceed residential PRGs are not anticipated to pose a significant risk based on limited distribution and exposure potential.

TABLE 2-1
SOIL COPC IDENTIFICATION SUMMARY

Constituent	CAS No.	EPA Group	Residential PRG (mg/kg)	Background Concentration (mg/kg)	95% UCL Concentration (mg/kg)	Maximum Concentration (mg/kg)	Frequency of Detection (%)	Rationale
COPCs								
1,1-dichloroethylene	75-35-4	C	3.70E-02	NA	5.53E-03	7.60E-01	11.48	Freq.>5% [b]
1,2,4-trimethyl benzene	95-63-6	NA	1.20E+03*	NA	9.17E-03	2.40E+01	8.96	Freq.>5% [b]
1,3,5-trimethyl-benzene	108-67-8	NA	1.43E+03*	NA	6.31E-03	7.80E+00	6.84	Freq.>5% [b]
aroclor 1248	12672-29-6	NA	6.60E-02	NA	1.86E-02	9.80E+00	1.26	>PRG[c]
aroclor 1254	11097-69-1	NA	6.60E-02	NA	1.80E-02	5.10E-01	0.95	>PRG[c]
aroclor 1260	11096-82-5	NA	6.60E-02	NA	1.76E-02	1.70E-01	1.58	>PRG[c]
arsenic	7440-38-2	A	—	1.40E+01	1.50E+00	4.90E+01	4.57	EPA Group A[a]
benzo(a)anthracene	56-55-3	B2	6.10E-01	NA	1.26E-01	6.20E+00	9.01	Freq.>5% [b]
benzo(a)pyrene	50-32-8	B2	6.10E-02	NA	2.38E-01	3.30E+00	5.01	>PRG[c]
benzo(b)fluoranthene	205-99-2	B2	6.10E-01	NA	2.47E-01	3.30E+00	5.58	Freq.>5% [b]
benzo(k)fluoranthene	207-08-9	B2	6.10E-01	NA	2.18E-01	1.30E+00	3.58	>PRG[c]
bis(2-ethylhexyl)phthalate	117-81-7	B2	3.20E+01	NA	1.20E-01	2.10E+02	6.29	Freq.>5% [b]
chrysene	218-01-9	B2	6.10E+00	NA	1.43E-01	8.80E+00	11.44	Freq.>5% [b]
dibenzo(a,h)anthracene	53-70-3	B2	6.10E-02	NA	9.51E-02	6.20E-01	0.72	>PRG[c]
fluoranthene	206-44-0	D	2.60E+03	NA	1.36E-01	1.00E+01	10.87	Freq.>5% [b]
indeno(1,2,3-cd)pyrene	193-39-5	B2	6.10E-01	NA	2.26E-01	1.50E+00	3.43	>PRG[c]
naphthalene	91-20-3	D	2.40E+02	NA	2.14E-01	6.30E+01	5.25	Freq.>5% [b]
n-butylbenzene	104-51-8	NA	1.64E+02*	NA	4.97E-03	6.80E-01	5.42	Freq.>5% [b]
n-propylbenzene	103-65-1	NA	1.64E+02*	NA	4.64E-03	1.30E+00	5.42	Freq.>5% [b]
p-cymene	99-87-6	NA	7.85E+02*	NA	4.37E-03	5.10E-01	5.19	Freq.>5% [b]
phenanthrene	85-01-8	D	1.40E+02*	NA	1.53E-01	3.60E+01	8.87	Freq.>5% [b]
pyrene	129-00-0	D	1.00E+02	NA	1.53E-01	2.60E+01	11.44	Freq.>5% [b]
tetrachloroethylene	127-18-4	NA	5.40E+00	NA	3.72E-03	9.90E+01	2.72	>PRG[c]
trichloroethylene	79-01-6	NA	3.20E+00	NA	7.68E-03	9.90E-01	16.76	Freq.>5% [b]
xylenes, total	1330-20-7	D	3.20E+02	NA	4.56E-03	3.70E+00	5.19	Freq.>5% [b]

TABLE 2-1
SOIL COPC IDENTIFICATION SUMMARY
(CONTINUED)

Constituent	CAS No.	EPA Group	Residential PRG (mg/kg)	Background Concentration (mg/kg)	95% UCL Concentration (mg/kg)	Maximum Concentration (mg/kg)	Frequency of Detection (%)	Rationale
Do Not Exceed Background								
barium	7440-39-3	NA	—	2.81E+02	1.12E+02	3.60E+02	98.31	<Background[d]
beryllium	7440-41-7	B2	—	7.40E-01	5.20E-01	1.00E+02	7.75	<Background[d]
cadmium	7440-43-9	B1	—	8.80E-01	2.54E-01	1.60E+01	10.53	<Background[d]
chromium, total	7440-47-3	NA	—	4.10E+01	2.73E+01	2.70E+02	98.51	<Background[d]
cobalt	7440-48-4	NA	—	2.00E+01	8.74E+00	4.81E+01	98.51	<Background[d]
copper	7440-50-8	D	—	5.30E+01	1.67E+01	1.71E+02	98.31	<Background[d]
lead	7429-92-1	B2	—	1.10E+02	3.63E+00	3.50E+02	22.14	<Background[d]
mercury	7439-97-6	D	—	2.80E-01	2.02E-02	1.26E+00	3.87	<Background[d]
molybdenum	7439-98-7	NA	—	2.30E+01	5.39E-01	6.97E+00	0.79	<Background[d]
nickel	7440-02-0	NA	—	2.90E+01	1.24E+01	1.40E+02	97.42	<Background[d]
thallium	7440-28-0	D	—	1.10E+01	1.08E+01	1.10E+01	0.30	<Background[d]
vanadium	7440-62-2	NA	—	8.20E+01	3.18E+01	7.55E+01	98.41	<Background[d]
zinc	7440-66-6	D	—	1.98E+02	5.36E+01	4.70E+02	98.41	<Background[d]
Less Than 5% and Max. Less Than Residential PRG								
1,1,1-trichloroethane	71-55-6	NA	1.20E+03	NA	5.30E-02	1.30E+01	1.29	<5%+<PRG[e]
1,1,2-trichloroethane	79-00-5	NA	6.50E-01	NA	3.58E-03	2.10E-01	1.00	<5%+<PRG[e]
1,1-dichloroethane	75-34-3	C	5.00E+02	NA	9.51E-03	1.30E+00	2.87	<5%+<PRG[e]
2-methylnaphthalene	91-57-6	NA	8.00E+02*	NA	8.42E-01	1.30E+02	4.01	<5%+<PRG[e]
acenaphthene	83-32-9	NA	1.10E+02	NA	9.70E-02	1.90E+00	1.43	<5%+<PRG[e]
anthracene	120-12-7	D	5.70E+00	NA	1.26E-01	5.00E+00	3.29	<5%+<PRG[e]
benzene, 1-methylethyl-	98-82-8	NA	1.90E+01	NA	8.97E-03	3.20E-01	3.30	<5%+<PRG[e]
benzo(ghi)perylene	191-24-2	NA	4.20E+00*	NA	1.88E-01	1.80E+00	4.15	<5%+<PRG[e]
cis-1,2-dichloroethylene	156-59-2	D	3.10E+01	NA	3.49E-03	8.30E-02	1.72	<5%+<PRG[e]

TABLE 2-1
SOIL COPC IDENTIFICATION SUMMARY
(CONTINUED)

Constituent	CAS No.	EPA Group	Residential PRG (mg/kg)	Background Concentration (mg/kg)	95% UCL Concentration (mg/kg)	Maximum Concentration (mg/kg)	Frequency of Detection (%)	Rationale
Less Than 5% and Max. Less Than Residential PRG (Cont.)								
ethylbenzene	100-41-4	D	2.30E+02	NA	1.27E-02	1.70E+00	2.01	<5%+<PRG[e]
fluorene	86-73-7	D	9.00E+01	NA	1.37E-01	6.40E+00	2.43	<5%+<PRG[e]
methylene chloride	75-09-2	B2	7.80E+00	NA	5.03E-03	3.50E-02	0.72	<5%+<PRG[e]
p-chloro-m-cresol	59-50-7	NA	3.26E+03*	NA	1.58E-01	1.90E+01	0.29	<5%+<PRG[e]
sec-butylbenzene	135-98-8	NA	1.64E+02*	NA	1.20E-02	3.80E-01	4.72	<5%+<PRG[e]
tert-butylbenzene	98-06-6	NA	1.64E+02*	NA	2.46E-02	2.70E+00	2.59	<5%+<PRG[e]
toluene	108-88-3	D	7.90E+02	NA	5.58E-02	1.40E+01	0.72	<5%+<PRG[e]
trans-1,2-dichloroethene	156-60-5	NA	7.80E+01	NA	3.14E-03	5.70E-02	0.14	<5%+<PRG[e]
trichlorofluoromethane	75-69-4	NA	3.80E+02	NA	5.01E-03	3.30E-02	0.43	<5%+<PRG[e]

RATIONALE:
[a]Selected as a COPC based on status as a "known carcinogen" (EPA Group A)
[b]Selected as a COPC because frequency of detection is above 5%.
[c]Selected as a COPC because maximum concentration exceeds EPA Region IX residential PRG.
[d]Eliminated as a COPC because 95% UCL concentration does not exceed background level.
[e]Eliminated as a COPC because frequency is below 5% and maximum concentration is below EPA Region IX residential PRG.

SOURCES:
EHP 1997 (EPA Weight-of-Evidence Group)
G&M 1997 (Background Concentration) per DTSC/HERD agreement (IESI 1998b)
EPA 1997 (Residential PRGs)
*Cal/EPA 1998 (DTSC surrogate PRG values)

ABBREVIATIONS:
NA = Not Applicable
UCL = Upper Confidence Limit

Step 6

Finally, inorganic constituent concentrations were compared to background concentrations. This was required to distinguish Parcel A related constituents from naturally occurring or unrelated anthropogenic constituents. The presence of unrelated anthropogenic constituents in the environment is due to human activity not attributed to Parcel A, such as deposition from automobile emissions. If the 95 percent UCL concentration of a detected inorganic constituent (normal distribution) is less than its background level, then that constituent was excluded from the COPC list. By agreement with DTSC/HERD (IESI 1998a), the recent risk assessment for the adjacent Lockheed Martin ILM property (G&M 1996) was used as the source of inorganic background levels.

Table 2-1, above, summarizes the COPC identification process for the Parcel A soils. Table 2-2, below, lists the resultant COPCs.

TABLE 2-2
COPCs FOR PARCEL A

1,1-dichloroethene	benzo(b)fluoranthene	n-butylbenzene
1,2,4-trimethylbenzene	benzo(k)fluoranthene	n-propylbenzene
1,3,5-trimethylbenzene	bis(2-ethylhexyl)phthalate	p-cymene
aroclor 1248	chrysene	phenanthrene
aroclor 1254	dibenzo(a,h)anthracene	pyrene
aroclor 1260	fluoranthene	tetrachloroethylene
arsenic	indeno(1,2,3-cd)pyrene	trichloroethene
benzo(a)anthracene	naphthalene	xylenes
benzo(a)pyrene		

BOE-C6-0113232